e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

# HEALTH MONITORING FOR SOLDIERS

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## ABSTRACT

This embedded system operates on a hierarchical network and is intended for usage by military personnel. Body vitality tests should be performed regularly to ensure safety and security. Arduino UNO (open-source microcontroller board), modules, and sensors are plugged into work on critical measures after an assessment of real-life and market research domains. Physiological temperature, ambient temperature, blood pressure, BPM (Heart rate), and many more essential body data are provided, along with GPS (location), radiofrequency, and an SOS for instant alert backup services. Confidentiality and security will be limited with military servers as a private network. The deep sleep method will solve the issue of battery draining, and solar cells will power the recharge of the transmitter end's open-source microcontroller board. The paper delves into the in-depth investigation of the merging of hardware and software development tools to form one and serve as a solution to various challenges. Multiple features can be added to this final market-friendly product with sufficient funding and research

**Keywords:** IoT, Soldiers, Health, Arduino, Security, Military.

## I. INTRODUCTION

Enemy warfare is one of the most important components of any nation's security in the current day. The security of the country is mostly dependent on three specialized uniformed services: the Army, the Air Force, and the Navy. Soldiers are a critical component of modern security systems. Soldiers engaging in any special operation or task carried out by these services are prone to be injured or lost on the battlefield. Because soldiers play an important role in national security, we cannot afford for them to become disoriented or for medics to arrive late to treat the injured. So, to safeguard these soldiers, we should have some technology that monitors and tracks them in real-time, reducing the time spent by the control unit on search and rescue operations.

To support this idea, the project proposes an effective system capable of monitoring soldiers' health vitals while also recording their current whereabouts utilizing essential sensors. Using wireless RF modules, the data collected from the sensors is subsequently transferred to the next level of the hierarchy. This technology allows the control room unit to constantly follow the location and vitals of the soldiers by employing the wireless body sensor network and the GPS receiver at regular intervals.

This system allows the control room unit to constantly follow the location and vitals of the soldiers by employing the wireless body sensor network and the GPS receiver at regular intervals. The Arduino connected to the control room constantly monitors the data received from the proposed system's many subsystems and issues a warning if any readings exceed the established threshold values. Live health monitoring and position tracking of soldiers ensure that they are safe on the battlefield, and if any abnormalities are discovered in the values received by the control unit node, they ensure that relief is sent from the control unit node or the squad leader's node within a short period.

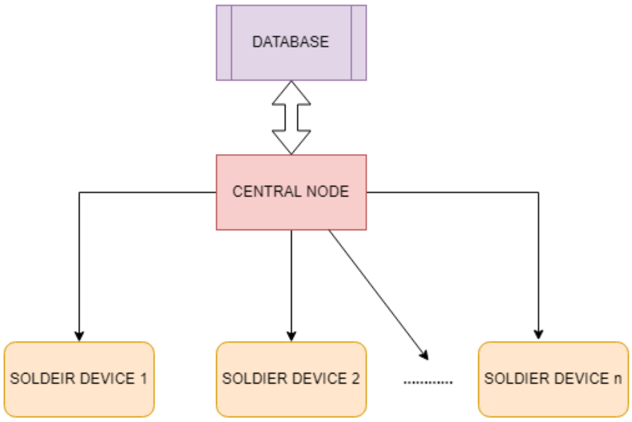


**Figure 1:** Overview of the System.

This system will be valuable for people who are involved in missions or special operations. There must be a method to eliminate and solve all these difficulties at the same time while being cost-effective. This project is built on the same approach. When completed, this initiative will address many of the communication issues that our soldiers confront while safeguarding our country. The plan is to attach a strap to the soldier's body that contains a GPS module, sensors to monitor important bodily data, and an SOS button. The GPS module will monitor the soldiers' movements. In addition, there will be a temperature sensor and a heart rate sensor, which will provide us with information about the soldier's health. In the event of a threat or emergency, the SOS signal will notify the base. The network's advantages include its flexibility; an ad hoc network can be formed anywhere using mobile devices. Scalability allows you to simply add new nodes to the network. Lower administrative costs, as there is no need to first create infrastructure. It is possible to set up multiple nodes without spending a lot of money.

All of this ensures that the soldiers' activities and well-being are logged and monitored and that they can alert the base if there is a problem. This is our attempt to reduce the problems that our soldiers, the people who fight for our protection, endure while on duty

## II. METHODOLOGY

The system operates on a hierarchical structure, with three tiers of architecture. Tier 1 is the most basic level. It is called Soldier Node. At this level, all data is collected and processed before being transferred to the top-level (through a wireless network) (tier 2). Tier 2 is known as the Command Node. This node receives input and processes it to extract information before saving it to the upper level (tier 3). Tier 2 scans the data for any dysfunctional behavior at any of the nodes. The third and final tier is a simple database where previous data is kept for future examination. Data is saved to be analyzed and saved.

At the soldier node, a microprocessor is used to command and receive data from all the sensors. The sensors are used to measure certain specifics like temperature, pulse, position, and panic stage. The temperature sensor helps us understand the situation of the soldier and understand the impact of the action necessary to help the soldier. Basic parameters like hyperthermia, hypothermia, and fever can easily be detected. External situations like being stuck in ice or stuck inside a volcano can be understood by the temperature sensor. The pulse sensor helps with an even more important function to know if the soldier is alive or is palpitating in that exact scenario. The entire device is connected with the other node by radio frequency with a good bandwidth and faster speeds.

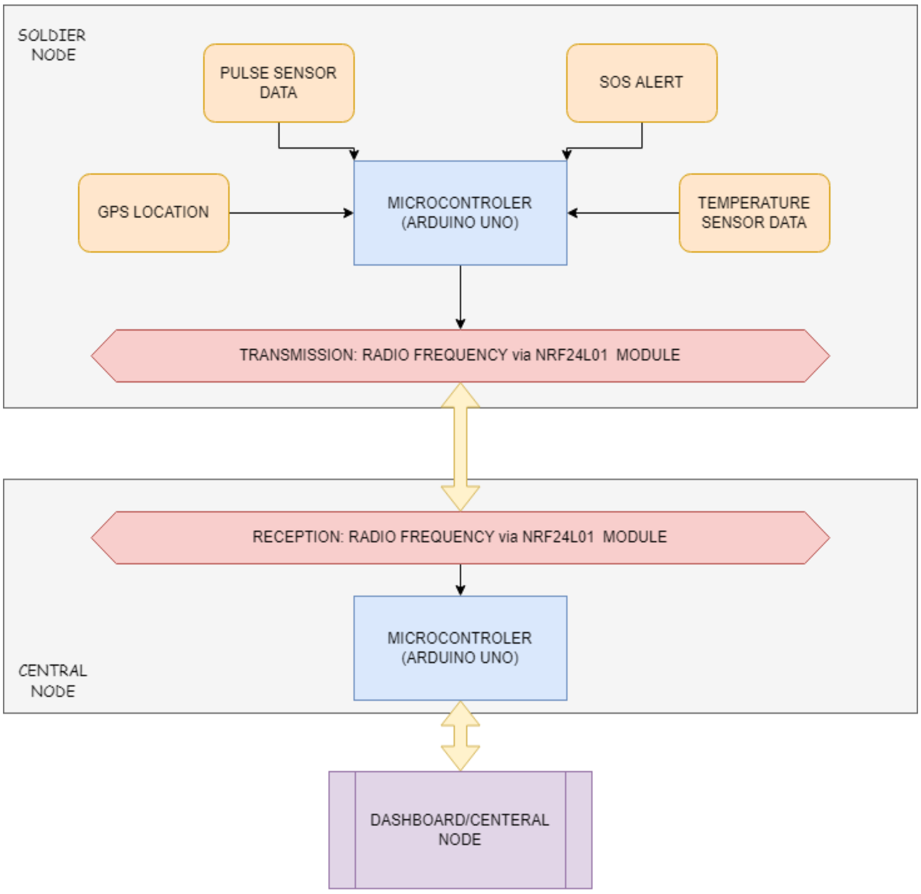


**Figure 2:** Block Diagram of the Proposed System.

The panic button is dedicated to being pressed by the soldier in case of an emergency and becomes a code red signal at the second node. All the data thus collected is sent to the central node for further analysis and storage. The most important part of the entire system is the positioning system which uses a GPS module that pinpoints the location of the soldier to a minimum amount of tolerance and hence making the entire system very sensitive. The GPS module uses a network of 3 satellites to properly locate the position.

The entire soldier level system i.e., tier 1 of the device is powered by a 9v battery which is dropped down to the microprocessor level and thus powering the sensors and the transmitter circuit. The entire data is sent in the form of data packets at proper intervals of time which doesn't stop the communication and thus delivers all the sent data.

The receiver side is yet another microprocessor with a Radiofrequency module attached to facilitate the receiving of data. The data received is then posted on to the dashboard which shows all the parameters onto a screen which is then used to monitor the health of the soldier. The panic button shows red when triggered. The location of the soldier is displayed as longitude and latitude. The beats per minute of the soldier are displayed and a graph to see the beats range and, hence understanding the situation.

## III. MODELING

Transmitter: This node is made up of body sensor networks (BSN), which include a temperature sensor and a pulse sensor. These sensors are used to monitor soldiers' vital signs. The temperature sensor (LM35) is used to monitor the temperature of the soldier and his surroundings, while the pulse sensor measures the soldier's pulse rate in beats per minute (BPM). It is considered an emergency if there is a disparity between the felt values and the stated threshold values. A GPS receiver, in addition to the BSN, is coupled to the node to locate and monitor the soldier's position. The data received from sensors is processed and recorded by the microcontroller before being transferred to the next node, the Command node, through the system's wireless RF transceiver module. Because the communication range between the soldier's node and the command leader's node is only a few kilometers, the RF module employed in the soldier's node is nRF24L01.

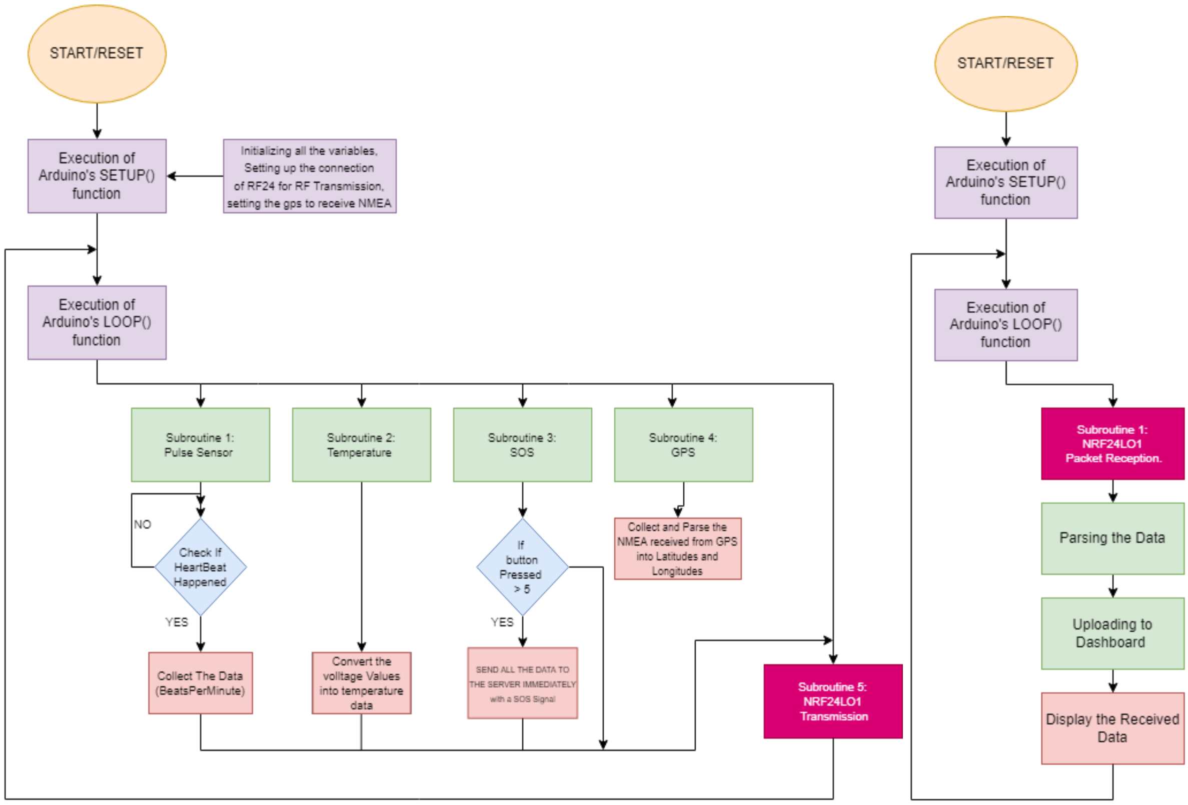


**Figure 3:** Flowchart for Transmitter and Receiver.

In addition, we use the Blynk application to link this node to the internet. We can link this node to the internet using a USB and a laptop. While this node is connected to the internet, data from the sensors is uploaded to the Blynk cloud and simultaneously provided to the dashboard, which is designed to communicate with the node via the cloud.

This node is solely responsible for monitoring, storing, and evaluating the received data. Furthermore, the control unit node is equipped with an additional capability that allows them to monitor soldiers directly via the internet via a graphical interface/dashboard. This is achievable if the soldier's module is likewise connected to the internet via the Blynk application on the mobile phone present at the control unit node.

## IV. RESULTS AND DISCUSSION

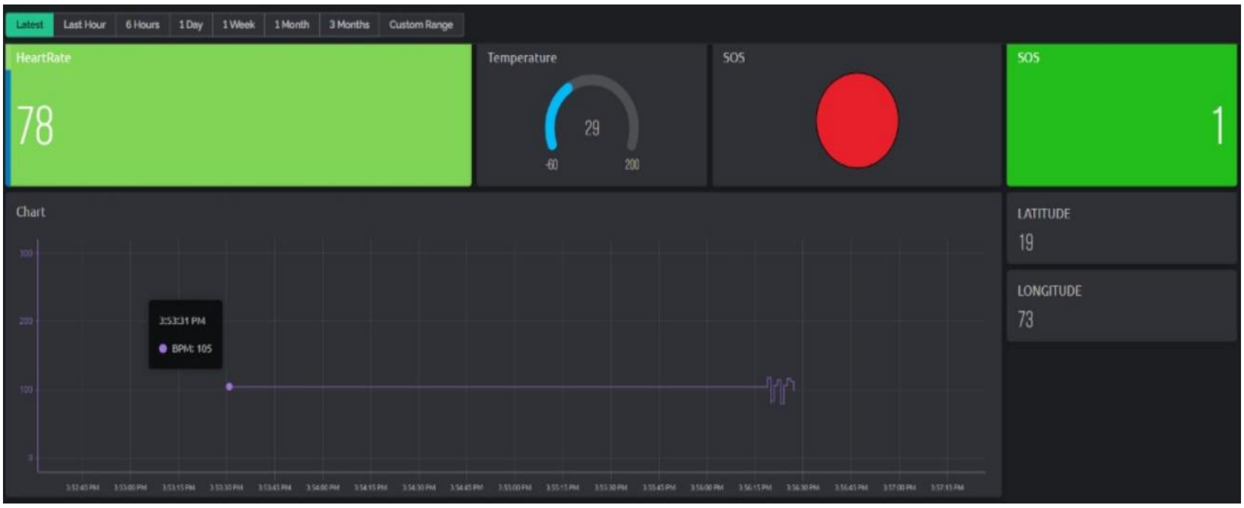

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**Figure 4:** Blynk Dashboard for Output.

## V. CONCLUSION

Soldiers are a crucial element of our nation's security, so their health vitals and whereabouts must be monitored frequently to ensure their safety and efficiency. Wireless connectivity with IoT makes the entire experience of monitoring soldiers' health vitals and location smart, efficient, and rapid. IoT technologies, for example, have profoundly altered the way we live and work, making our lives easier. The suggested system not only monitors the real-time health and location data of the soldiers, but it also gives necessary data to assist us to establish the last position and health data of the soldiers if he gets lost so that we can track them down and send help. This technology improves the performance of soldiers in the field while also reducing the effort of a search and rescue operation conducted by a control center unit. Overall, the system's compactness and lightweight make it easier for soldiers and squadron leaders to carry the system with them, allowing the control unit node to watch their data in real-time, even if they are thousands of kilometers distant. There is an enormous horizon of possibilities that could be offered - new designs, advanced systems could be introduced to improve the conditions and efficiency of the system, and by introducing AI/ML algorithms we can predict soon if any soldier might require medical attention beforehand, as well as whether a component or sensor might require attention or replacement. Implementing advanced security protocols/techniques on wireless RF modules, for example, can make the entire process of transmitting and receiving sensor data safer and more trustworthy.

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